Iceland

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1. SUMMARY

Base-year emissions of greenhouse gases for Iceland are calculated using 1990 emissions for carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) and 1995 emissions for fluorinated gases (SF6, HFCs and PFCs).

Iceland's fourth National Communication (4NC) provides projections for two scenarios. Scenario 1 assumes no additions to energy-intensive industries other than those already in progress in 2004/2005, meaning the enlargement of the Century Aluminium plant in Hvalfjörður and the building of the Alcoa aluminum plant in Reyðarfjörður. Scenario 2 is based on the assumption that all energy intensive projects that currently have an operational license will be built, which means four new projects in addition to the two projects already included in scenario 1. This includes an enlargement of the Alcan aluminium plant in Straumsvík, an enlargement of the Icelandic Alloys ferrosilicon plant in Hvalfjörður, a further enlargement of the Century Aluminium plant, and the building of Kapla, an anode production plant in Hvalfjörður. For the purpose of this Country Profile, scenario 2 is taken as the "with existing measures" projection as these projects, although not built yet when the 4NC was submitted, had been given operational licences.

Iceland's policies and measures include increasing carbon sequestration, collection of landfill gases for energy recovery and consultation process with aluminium smelters to ensure the minimization of PFC emissions from the aluminium industry. In 2005 the government changed the tax system to favour diesel powered cars over gasoline powered. This is estimated to lead to a decrease in GHG emissions by 2010. Furthermore, nearly every home and company in Iceland is supplied with sustainable energy, therefore population increase and the associated increased use of energy makes a negligible difference to emissions.

Iceland did not submit sectoral projections for 2010. The total projections for 2010 show a 3.7% increase in emissions from the base year. Iceland's emissions have increased significantly in recent years but these emissions are related to emissions of carbon dioxide from a few very energy intensive projects implemented since 1990, which Iceland is able to report separately, in line with decision 14/CP.7. One of these projects is a new aluminium smelter which has been operated since 2007. Because of the small size of the Icelandic economy, such projects have a big impact on total emission levels, despite the fact that they use only renewable energy and are required to use best available technology to minimize emissions from industrial processes.

By applying decision 14/CP.7, it is projected that Iceland will meet its 2010 commitments under the Kyoto Protocol despite the predicted increase in overall emissions. The aluminium and ferrosilicon industries are export industries, and Iceland has argued that expansion of such energy-intensive industry in the country is beneficial from the perspective of climate change mitigation, because their use of renewable energy and best available technology ensures that emissions are as low as possible from a global perspective.

Projections for 2020 for Iceland include the emissions from the selected new energy intensive projects, formerly reported separately in line with decision 14/CP.7 as the decision only

applies to the first commitment period. However, this decision may be subject to change in the future and become reported in similar manner as the 2010 projections.

In terms of the quality and completeness of reporting in Iceland's 4NC, policies and measures were well described but with limited quantification. The reporting of projections would benefit from a split by gas and sector, and the full time series of base year, 2005, 2010, 2015 and 2020.

2. GHG PROJECTIONS AND PROGRESS TO KYOTO TARGETS

Total GHG emissions in Iceland in 2010 are projected to be 3.7% above base year emissions, which means that Iceland expects to overachieve its Kyoto target of a 10% increase in base year emissions (3.7 MtCO₂-eq.).

The following Table 1 shows, for all gases and main sectors:

- GHG emission projections for the "with existing measures" (WEM) scenario, as reported by Iceland;
- Historic emissions (in the "reference year") as reported together with projections. For Iceland, the reference year is 1990.

Table 2 shows, for all gases and main sectors:

- 1990 GHG emissions as reported in the latest (2008) GHG emissions inventory (1990-2006):
- Adjusted GHG emission projections for the WEM and WAM scenarios. This
 adjustment of the projections reported in Table 1 is carried out to allow consistency
 and comparability between projections and the latest (2008) GHG inventory data¹. In
 the case of Iceland, the result of the correction factor is to slightly increase the
 projections in the 4NC, as shown in Figure 2.

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¹ The adjustment consists in applying an adjustment factor to projections from Table 1. This factor is the ratio between total emissions in the reference year as reported in the 2008 GHG inventory report (or, if the reference year is the base-year under the Kyoto Protocol, in the report of the review of the initial report under the Kyoto Protocol) and total emissions in the reference year as reported by the country with projections (Table 1).

Table 1. Summary of reported projections by sector and by gas in 2010 (Mt CO₂-eq.)

	Carl	on dioxid	е		Methane		Nit	rous oxide	9		F-gases		Total		
	Reference year	2010 WEM	2010 WAM												
Energy (excl.	NE	NE	NE												
transport) Energy supply	NE	NE	NE												
Energy – industry, construction	NE	NE	NE												
Energy – other (commercial, residential, agriculture)	NE	NE	NE												
Transport	NE	NE	NE												
(energy) Industrial processes	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE NE	NE	NE	NE	NE	NE
Waste	NE	NE	NE												
Agriculture	NE	NE	NE												
Other	NE	NE	NE												
Total (excl. LULUCF)	2.08	NE	NE	0.41	NE	NE	0.36	NE	NE	0.43	NE	NE	3.28	3.36	NE

Key:

Reference year: 1990

WEM: 'with existing measures' projection WAM: 'with additional measures' projection

Source: Iceland's 4NC, March 2006.

Table 2. Summary of projections by sector and by gas in 2010 compared to 1990 emissions (MtCO₂-eq.)

	Ca	rbon dioxi	de		Methane		N	litrous oxid	de		F-gases			Total	
	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM	1990	2010 WEM	2010 WAM
Energy (excl. transport)	1.18	NE	NE	0.00	NE	NE	0.02	NE	NE	NA	NE	NE	1.21	NE	NE
Energy supply	0.09	NE	NE	0.00	NE	NE	0.00	NE	NE	NA	NE	NE	0.09	NE	NE
Energy – industry, construction	0.38	NE	NE	0.00	NE	NE	0.02	NE	NE	NA	NE	NE	0.39	NE	NE
Energy – other (commercial, residential, agriculture)	0.72	NE	NE	0.00	NE	NE	0.01	NE	NE	NA	NE	NE	0.73	NE	NE
Transport (energy)	0.62	NE	NE	0.00	NE	NE	0.01	NE	NE	NA	NE	NE	0.63	NE	NE
Industrial processes	0.41	NE	NE	0.00	NE	NE	0.05	NE	NE	0.44	NE	NE	0.90	NE	NE
Waste	0.02	NE	NE	0.16	NE	NE	0.01	NE	NE	NA	NE	NE	0.19	NE	NE
Agriculture	0.00	NE	NE	0.31	NE	NE	0.29	NE	NE	NA	NE	NE	0.60	NE	NE
Other	0.01	NE	NE	0.00	NE	NE	0.01	NE	NE	NA	NE	NE	0.01	NE	NE
Total (excl. LULUCF)	2.24	NE	NE	0.47	NE	NE	0.38	NE	NE	0.44	NE	NE	3.54	3.49	NE

Key:

WEM: 'with existing measures' projection WAM: 'with additional measures' projection

Table 3. Summary of projections by sector and by gas in 2010 compared to 1990 emissions (index 100 = 1990)

		Carbon dio	xide		Methane			Nitrous oxi	de		F-gases			Total	
	1990	2010 WEM	2010 WAM												
Energy (excl. transport)	100	NE	NE												
Energy supply	100	NE	NE												
Energy – industry, construction	100	NE	NE												
Energy – other (commercial, residential, agriculture)	100	NE	NE												
Transport (energy)	100	NE	NE												
Industrial processes	100	NE	NE												
Waste	100	NE	NE												
Agriculture	100	NE	NE												
Other	100	NE	NE .	100	NE	NE									
Total (excl. LULUCF)	100	NE	NE	100	98.6	NE									

Key:

WEM: 'with existing measures' projection WAM: 'with additional measures' projection

Table 4. Summary of projections in 2010 compared to base year emissions under the Kyoto Protocol

	Unit	Base-year emissions under the Kyoto Protocol	2010 projections 'with existing measures'	2010 projections 'with additional measures'
Total GHG emissions	Mt CO ₂ -eq.	3.37	3.49	NE
(excluding LULUCF)	Index (base-year emissions = 100)	100	103.7	NE

Source: Iceland's 4NC, March 2006; Annual greenhouse gas inventory 1990 - 2006 and inventory report, 28 April 2008.

In Figure 1, the same correction factor used in Table 2 has been applied to the projections for 2010, 2015 and 2020. Figure 1 presents the "with existing measures" scenario (Scenario 2).

The red lines in Figure 1 and 2 indicate the Kyoto target of 3.7 Mt CO₂-eq., based on the revised Kyoto base year, 2008.

Figure 1. Greenhouse gas projections in 2010, 2015 and 2020 (Mt CO2-eq.)

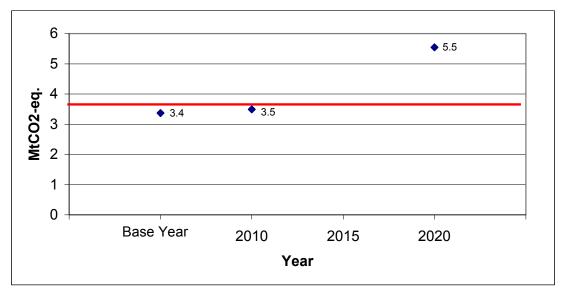
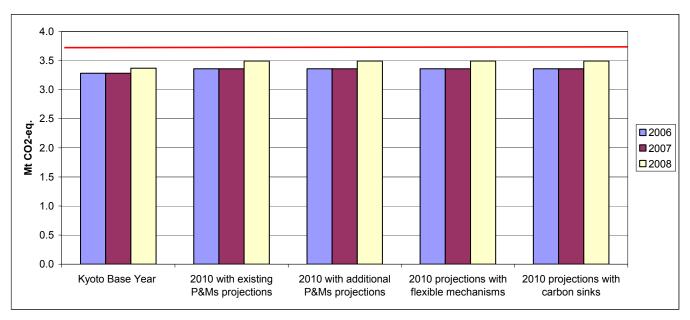


Figure 2. Comparison of 2010 projections reported in 2006, 2007 and 2008



3. CLIMATE CHANGE MITIGATION POLICIES AND MEASURES

The main policy and measure (PAM) identified in Iceland's Demonstrable Progress Report is "Consultation process with aluminium smelters to ensure the minimisation of PFC emissions", which contributes 0.187 Mt CO₂–eq. of a total of 0.226 Mt CO₂–eq. quantified emission reductions from PAMs in 2010².

Table 5. Summary of the effect of policies and measures included in the 2010 projections (Mt CO_2 -eq.)

	Top down	calculation	Bottom Up	calculation
	Existing Measures	Planned Measures	Existing Measures	Planned Measures
Energy (total, excluding transport)	NE	NE	NE	NE
Energy supply Energy – industry, construction	NE NE	NE NE	NE NE	NE NE
Energy – other (commercial, residential, agriculture)	NE	NE	NE	NE
Transport (energy)	NE	NE	0.009	NE
Industrial processes	NE	NE	0.187	NE
Waste Agriculture	NE NE	NE NE	0.030 NE	NE NE
Cross-sectoral	NE	NE	NE	NE
Total (excluding LULUCF)	NE	NE	0.226	NE

Note: The effects of measures detailed above are calculated firstly by determining the difference between total projections in each scenario ('top down calculation') and secondly by summing the reported effect of individual measures ('bottom up calculation'). A top down calculation was not possible for Iceland as only a "with existing measures" scenario was provided.

Source: Iceland's Demonstrable Progress Report, March 2006.

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 $^{^2}$ This excludes the other main PAM identified in the 4NC, "increasing carbon sequestration", as LULUCF is not included in the Country Profiles.

Table 6 is taken from the UNFCCC country profile and is based on information in the 3rd National Communication. No table of policies and measures was provided in the 4th National Communication/DPR although a range of policies and measures is described.

Table 6. Detailed information on Existing Policies and measures

Major policies and measures	Examples / comments					
Framework policies and cross-sectors	al measures					
Integrated climate programme	Revised implementation strategy for UNFCCC (2002)					
Energy sector						
Energy sector liberalization	Act on deregulation of the electricity market (2003)					
Renewable energy sources	Strategy for sustainable development "Welfare for the future" (2002)					
Transport						
Vehicle and fuel taxes	Planned change of taxation to favor diesel fuel; planned change in import fees					
Public and non-road transport	Measures to improve public transportation and transport logistics					
Integrated transport planning	National plan for the development of transport (2002)					
Other	Support for research, development and use of hydrogen-fuelled and methane-					
	fuelled vehicles, including the international ECTOS project (2001–2005)					
Fisheries*						
Energy efficiency improvements	Energy efficiency information campaigns, including seminars and workshops on					
	fuel use for fishers; encouragement of the use of best available technologies; use					
	of electricity by ships on shore; measures for switching to electricity at fishmeal					
	factories					
Pollution prevention and control	Restrictions on the use of HFC cooling systems					
Industry	Voluntary agreement between aluminium industry and the Government on PFC ^b					
	emissions per tonne of aluminium produced					
Waste management	Strategy for sustainable development "Welfare for the future"; collection and					
	utilization of methane from the Rejkjavik landfill (1997)					
Forestry	Four-year programme of revegetation and tree planting (1997-2000); strategic					
	plan for soil conservation and revegetation (2002); five-year plan of action for the					
	forestry sector					

Source: UNFCCC country profile, 2005.

Table 7. Detailed information on Planned Policies and measures

Iceland's 4NC/DPR did not provide information on planned policies and measures.

4. METADATA

Sources of information

Iceland's Fourth National Communication and Report on Demonstrable Progress submitted to the UNFCCC, dated March 2006.

Iceland's Annual greenhouse gas inventory 1990 - 2006 and inventory report, 28 April 2008.

Base-year emissions from the UNFCCC website, http://unfccc.int/ghg_data/kp_data_unfccc/base_year_data/items/4354.php

Additional information was taken from the UNFCCC Country Profile on Iceland, 2005.

Kyoto base-year emissions

Kyoto base-year emissions are presented throughout, except Table 1 which presents projections reference year emissions (see below). Kyoto base year emissions of greenhouse gases were calculated using 1990 emissions for carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) and 1995 emissions for fluorinated gases (SF₆, HFCs and PFCs).

Kyoto base-year emissions have now been reviewed and set for all EEA countries.

Projections reference year emissions

Projections reference year emissions are presented in Table 1.

Projections reference year emissions are defined as projections-consistent emissions data for a given historic year, as chosen by the Member State. Inventory recalculations from year to year may mean that latest inventory data cannot be compared with projections based on older inventory data. Where such an inconsistency has arisen, MS projections have been corrected by applying the following formula, in Table 2:

Corrected projection = reported projections * latest inventory total GHG emissions / Table 1 reported total GHG emissions for the same reference year

Quality of Reporting

National reporting in the sources detailed above was assessed semi-qualitatively. Scoring was attributed according to the level of detail and clarity: from o (representing not reported) to +++ (representing very detailed and/or clear reporting). Guidance used for this assessment included the reporting requirements laid down in the UNFCCC reporting guidelines for national communications available in English, French, Spanish ("Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II: UNFCCC reporting guidelines on national communications - FCCC/CP/1999/7").

The following tables detail reporting considered to be best practice for the purposes of this assessment.

	Example of good practice
Information provided	
Policy names	Clear names and description provided with unique identifier.
Objectives of policies	Good description of objectives
Types of policies	Type of policy instrument specified e.g. regulatory, fiscal
Which greenhouse gases?	Specifies which gases each PAM affects
Status of Implementation	Clear for each PAM: planned, adopted, implemented, expired
Implementation body	Clear which authorities are responsible for implementation
Quantitative assessment of emission reduction effect and cost of policies	Almost all PAMs are actually quantified. Total effect of all PAMs specified. WOM projection provided.
Interaction with other national and EU level policies	Detailed discussion and analysis of policy interactions.
Measures implementing community legislation	Report details which national policies are implementing individual pieces of EU legislation.
Arrangements for flexible mechanisms	Details arrangements for use of flexible mechanisms.
Balance between domestic action and flexible mechanisms	Regarding reductions required to meet Kyoto target, details proportion to result from domestic action and flexible mechanisms.

	Example of good practice
Category of Information	
Projection scenarios Policies included in each projection	"With existing measures" and "with additional measures" projections required, "without measures projection" optional. Clear presentation of the policies included in each projections scenario.
Expressed relative to historic reference year data	Projections are presented alongside consistent historic emissions.
Starting year	Starting year and emissions used as basis for projections is detailed.
Split of projections	Projection split by all 6 gases (or F-gases together), all sectors and years
Presentation of results	Clear, both tables and graphs provided and/or used excel reporting template.
Description of methodologies	Description of approach, model and assumptions
Sensitivity analysis	Was an analysis carried out to determine the sensitivity of projections to variance in the input parameters? Are high medium and low scenarios presented?
Discussion of uncertainty	Is an uncertainty range for the projections provided?
Details of parameters and assumptions	Are parameters as required under Monitoring Mechanism 280/2004/EC reported?
Indicators for projections	Are indicators for projections as required under Monitoring Mechanism 280/2004/EC reported?

Table 8. Information provided on policies and Kyoto flexible mechanisms

Information provided	Level of information provided	Comments
Policy names	+++	Clear names provided
Objectives of policies	++	
Types of policies	0	Types not specified
Which greenhouse gases?	++	
Status of Implementation	++	
Implementation body	0	Not specified
Quantitative assessment of emission reduction effect and cost of policies	+	Limited quantification for 2010
Interaction with other national and EU level policies	0	Not discussed
Measures implementing community		
legislation	0	Not discussed
Arrangements for flexible mechanisms	0	Not discussed
Balance between domestic action and flexible mechanisms	0	Not discussed

Table 9. Information provided on projections

Category of Information	Level of information provided	Comments
Projection scenarios	++	Scenario 1 and 2. Scenario 2 is considered the 'With existing measures' scenario here.
Policies included in each projection		
Expressed relative to base year	++	Base year amounts for different gases not stated. Tables and graphs suggest 1990 but do not specify if different for F-gases.
Starting year	0	Not clear
Split of projections	+	No split by gas or sector in the tables or text. Only 2010 and 2020 projections are provided.
Presentation of results	+++	Both tables and graphs provided
Description of methodologies (approach, model and assumptions)	+	No description of the model/s used to make projections is provided in the report, but it does discuss modelling assumptions.
Sensitivity analysis	++	A sensitivity analysis was carried out with one alternative scenario.
Discussion of uncertainty	0	Not provided
Details of parameters and assumptions	++	Model parameters/assumptions discussed.
Indicators for projections	0	Not provided

Parameters for projections are presented in Table 10. Iceland's 4NC and DPR do not provide details of any of the parameters.

Table 10. Parameters for Projections

1. Mandatory parameters on projections	2005	2010	2015	2020	Units
Assumptions for general economic parameters					
GDP (value at given years or annual growth rate and base year)					
Population (value at given years or annual growth rate and base year)					
International coal prices at given years in euro per tonne or GJ (Gigajoule)					
International oil prices at given years in euro per barrel or GJ					
International gas prices at given years in euro per m3 or GJ					
Assumptions for the energy sector					
Total gross inland consumption (PJ) (split by oil, gas, coal, renewables, nuclear, other)					
Total electricity production by fuel type (oil, gas, coal, renewables, nuclear, other)					
Energy demand by sector split by fuel (delivered)					
Assumptions on weather parameters, especially heating or cooling degree days					
Assumptions for the industry sector					
For Member States using macroeconomic models:	i				
The share of the industrial sector in GDP and growth rate					
For Member States using other models:	i				
The production index for industrial sector					
Assumptions for the transport sector					
For Member States using macroeconomic models:					
The growth of transport relative to GDP					
For Member States using other models:					
The growth of passenger person kilometres					
The growth of freight tonne kilometres					
Assumptions for buildings (in residential and commercial or tertiary sector)					
For Member States using macroeconomic models:					
The level of private consumption (excluding private transport)					
The share of the tertiary sector in GDP and the growth rate					
For Member States using other models:					
The rate of change of floor space for tertiary buildings and dwellings					
The number of dwellings and number of employees in the tertiary sector					
Assumptions in the agriculture sector					
For Member States using macroeconomic models:					
The share of the agriculture sector in GDP and relative growth					
For Member States using other models:					
Livestock numbers by animal type (for enteric fermentation beef, cows,					
sheep, for manure management pigs and poultry)					
The area of crops by crop type					
Emissions factors by type of livestock for enteric fermentation and manure management (t)					
Assumptions in the waste sector					
Waste generation per head of population or tonnes of municipal solid waste					

The organic fractions of municipal solid waste			
Municipal solid waste disposed to landfills, incinerated or composted (in tonnes or %)			
Assumptions in the forestry sector			
Forest definitions			
Areas of:			
managed forests			
unmanaged forests			

2. Recommended parameters on projections	2005	2010	2015	2020	Units
Assumptions for general economic parameters					
GDP growth rates split by industrial sectors in relation to 2000					
Comparison projected data with official forecasts					
Assumptions for the energy sector					
National coal, oil and gas energy prices per sector (including taxes)					
National electricity prices per sector as above (may be model output)					
Total production of district heating by fuel type					
Assumptions for the industry sector					
Assumptions fluorinated gases:					
Aluminium production and emissions factors					
Magnesium production and emissions factors		Ì	T i		
Foam production and emissions factors		ĺ	i		
Stock of refrigerant and leakage rates		Ì	i		
For Member States using macroeconomic models:		ĺ	i		
Share of GDP for different sectors and growth rates		Ì			
Rate of improvement of energy intensity (1990 = 100)		ĺ			
For Member States using other models:					
Index of production for different sectors					
Rate of improvement or index of energy efficiency		ĺ	ĺ		
Assumptions for buildings (in residential and commercial / tertiary sector)					
For Member States using macroeconomic models:					
Share of tertiary and household sectors in GDP					
Rate of improvement of energy intensity					
For Member States using other models:		Ì	i		
Number of households					
Number of new buildings					
Rate of improvement of energy efficiency (1990 = 100)					
Assumptions for the transport sector					
For Member States using econometric models:					
Growth of transport relative to GDP split by passenger and freight					
Improvements in energy efficiency split by vehicle type					
Improvements in energy efficiency split by vehicle type, whole fleet/new cars					
Rate of change of modal split (passenger and freight)		ĺ	T I		
Growth of passenger road kilometres			i		
Growth of passenger rail kilometres		j	i		
Growth of passenger aviation kilometres		i	i		
Growth of freight tonne kilometres on road		j	i		
Growth of freight tonne kilometres by rail					

Growth of freight tonne kilometres by navigation			
Assumptions for the agriculture sector			
For Member States using econometric models:			
Agricultural trade (import/export)			
Domestic consumption (e.g. milk/beef consumption)			
For Member States using other models:			
Development of area of crops, grassland, arable, set-aside, conversion to forests etc			
Macroeconomic assumptions behind projections of agricultural activity			
Description of livestock (e.g. by nutrient balance, output/animal production, milk production)			
Development of farming types (e.g. intensive conventional, organic farming)			
Distribution of housing/grazing systems and housing/grazing period			
Parameters of fertiliser regime:			
Details of fertiliser use (type of fertiliser, timing of application, inorganic/organic ratio)			
Volatilisation rate of ammonia, following spreading of manure on the soil			
Efficiency of manure use			
Parameters of manure management system:			
Distribution of storage facilities (e.g. with or without cover):			
Nitrogen excretion rate of manures			
Methods of application of manure			
Extent of introduction of control measures (storage systems, manure application), use of best available techniques			
Parameters related to nitrous oxide emissions from agricultural soils			
Amount of manure treatment			